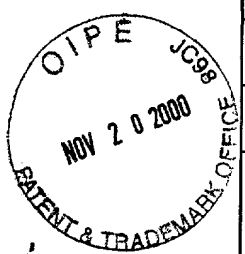


11-2 528 Rec' PCT/PTO 20 NOV 2000



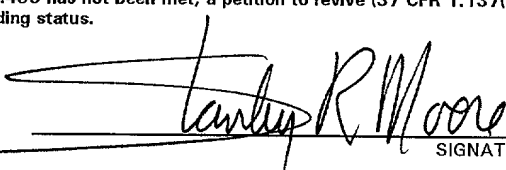
RECEIVED NOV 20 2000

FORM PTO-1390 (REV. 5-93)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)	ATTORNEY'S DOCKET NUMBER 28170-00026
INTERNATIONAL APPLICATION NO. PCT/NO99/00160		INTERNATIONAL FILING DATE 20 May 1999	U.S. APPLICATION NO. <b>09/700970</b> PRIORITY DATE CLAIMED 25 May 1998
TITLE OF INVENTION METHOD RELATED TO CLOCK DELAY COMPENSATION			
APPLICANT(S) FOR DO/EO/US Reidar SCHUMANN-OLSEN			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.			
2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.			
3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371 (f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371 (b) and PCT Articles 22 and 39(1).			
4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.			
5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))			
a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).			
b. <input type="checkbox"/> has been transmitted by the International Bureau.			
c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US)			
6. <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).			
7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))			
a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).			
b. <input type="checkbox"/> have been transmitted by the International Bureau.			
c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.			
d. <input type="checkbox"/> have not been made and will not be made.			
8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).			
9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) ( <u>unsigned</u> )			
10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).			
Items 11. to 16. below concern other document(s) or information included:			
11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.			
12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.			
13. <input type="checkbox"/> A FIRST preliminary amendment.			
<input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.			
14. <input type="checkbox"/> A substitute specification.			
15. <input type="checkbox"/> A change of power of attorney and/or address letter.			
16. <input checked="" type="checkbox"/> OTHER ITEMS OR INFORMATION: COPY OF NOTICE UNDER PCT RULE 47.1; COPY OF NOTICE UNDER PCT RULE 61.3; COPY OF PCT DEMAND; COPY OF WRITTEN OPINION OF 03/16/00; COPY OF REPLY TO WRITTEN OPINION DATED 06/20/00; COPY OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT; 2 SHEET OF FORMAL DRAWING; COPY OF THE INTERNATIONAL SEARCH REPORT; COPY OF THE PCT REQUEST; and CONFIRMATION POSTCARD.			

CERTIFICATE OF MAILING BY EXPRESS MAIL

"EXPRESS MAIL" Mailing Label No. EL654513407US  
Date of Deposit: November 20, 2000  
I hereby certify that this paper or fee is being deposited with the U.S. Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231

Type or Print Name: Dorothy MacKinnon  
*Dorothy MacKinnon*  
Signature

U.S. APPLICATION NO. <b>09/7700970</b> <small>(U.S. Patent, 37 C.F.R. 1.50)</small>		INTERNATIONAL APPLICATION NO. PCT/NO99/00160		ATTORNEY'S DOCKET NUMBER 28170-00026	
17. <input checked="" type="checkbox"/> The following fees are submitted:				<b>CALCULATIONS</b>	PTO USE ONLY
<b>Basic National Fee (37 CFR 1.492(a)(1)-(5)):</b> Search Report has been prepared by the EPO or JPO ..... 840.00  International preliminary examination fee paid to USPTO (37 CFR 1.482) \$670.00  No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) ..... \$730.00  Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$1000.00  International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) ..... \$96.00  <b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				\$ 1000	
Surcharge of \$130.00 for furnishing the oath or declaration later than <u>20</u> <u>30</u> months from the earliest claimed priority date (37 CFR 1.492(e)).					
Claims	Number Filed	Number Extra	Rate		
Total Claims	2 - 20 =	0	x \$18.00	\$	
Independent Claims	1 - 3 =	0	x \$80.00	\$	
Multiple dependent claims(s) (if applicable)			+ \$270.00	\$	
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$ 1000	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				\$	
<b>SUBTOTAL =</b>				\$ 1000	
Processing fee of \$130.00 for furnishing the English translation later the <u>20</u> <u>30</u> months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
<b>TOTAL NATIONAL FEE =</b>				\$ 1000	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				\$	
<b>TOTAL FEES ENCLOSED =</b>				\$ 1000	
				Amount to be: refunded	\$
				charged	\$
a. <input checked="" type="checkbox"/> A check in the amount of \$1000 to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. <u>10-0447</u> in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>10-0447</u> . A duplicate copy of this sheet is enclosed.					
<b>NOTE:</b> Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO:  Stanley R. Moore, Esq. Jenkins & Gilchrist, P.C. 3200 Fountain Place 1445 Ross Avenue Dallas, Texas 75202-2799 214/855-4500					
				 SIGNATURE	
				Stanley R. Moore NAME	
				26,958 REGISTRATION NUMBER	

METHOD RELATED TO CLOCK DELAY COMPENSATIONField of the invention

The present invention concerns a method related to clock delay compensation, especially related to connection of data communication equipment (DCE) to modems and other types of data transmission equipment (DTE).

The present invention also relates to data transmission interfaces.

More particularly, the present invention relates to a method as stated in the preamble of the enclosed patent claim 1.

Background of the invention

## THE PROBLEM AREA

For connection and data communication equipment (DCE) to modems and other types of data transmission equipment (DTE) there are standardised several interfaces. These interfaces define data and clocking as well as control lines. Typical interfaces mentioned are RS232 (V.24), V.35, V.36 and X.21. The electrical interfaces for the interface are defined in V.10, V.11 and V.28.

Basically, these interfaces were defined according to ITU rec. X21 which limits the bitrate to 64 kbit/s.

With use of the electrical interfaces V.11 ranges of several hundreds of meters of cable can be used. The interface V.35, V.36 and X.21 define this electrical interface for clock and data.

In connection with the use of this interface for bitrates higher than 64 kbit/s, by now up to 2 Mbit/s one problem

**AMENDED SHEET**

has arisen, caused by the pulse delay on a long cable becoming comparable with the period of the clock.

In the case of a codirectional interface, that is clock and data have the same source, the delay is not a problem, but in the case where a contradirectional interface is used, like the X.21 interface or use of DCE-clock (114) on V.35/V.36, there will be a problem of detecting the data signal with the DCE-clock. This because the data signals have an arbitrarily unknown delay through the cable.

#### KNOWN SOLUTION

To overcome this problem, the DCEs are equipped with a manual option of changing the phase of the detecting clock, thus avoiding sampling of data close to the transitions. An extra not standardised X-circuit on the X.21 interface is also used.

#### PROBLEMS WITH KNOWN SOLUTIONS

Problems with known solutions are that the cable delay is unknown and the manual selection of inverted or not inverted clock is done on the respective site installation by trial. The X-circuit is not standardised and is by customers not recommended.

#### Further prior art

US 5 568 526 (Ferraiolo et al.) relates to a self-timed interface (STI) in which a clock signal clocks bit serial data onto a parallel, electrically conductive bus and the clock signal is transmitted on a separate line of the bus. The received data on each line of the bus is individually phase aligned with the clock signal. The received clock signal is used to define boundary edges of a data bit cell individually for each line, and the data on

each line of the bus is individually phase adjusted so that, for example, a data transition position is in the centre of the cell. Data are read into a buffer storage with the received clock and are read out with an internal  
5 clock in the interface.

EP 0 602 898-A1 (Kawada/Fujitsu Limited) relates to a method and apparatus for synchronising transmission of modem. The phase difference between internal and external data/clock signals are equalised, by controlling the in-  
10 ternal timing signal so that the measured phase difference will approach a reference phase difference.

EP 0 603 600-A3 (Klimek et al./Siemens Rolm Communications Inc.) relates to path delay compensation in an open-loop system, the signal paths being compensated by  
15 internal clocks in the units of the system. The compensation is based on a synchronising signal.

US 4 916 717 (Sackman, III et al.) relates to clock synchronisation of a master clock following data messages received from a remote data transmitter having the same  
20 clock frequency, but which is phase shifted due to delays in the signal paths.

Further publications related to this technical field are NO patent applications 924247 (Coquerel/Institut Français du Pétrole), 942171 (Hedberg/Ericsson), 961421 (Buhrgard/Ericsson) and 961454 (Buhrgard/Ericsson).  
25

US 5 115 455 describes a method for stabilized data transmission. This invention only solves delay problems with clock and data signals in the same direction (DCE-DTE). It is not a general solution on the 103/T (X.21 terminology) detection problem which includes detection  
30 in a contra-directional interface.

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US 5 566 215 describes a method for restoring a clock signal by punctuating the transmission of the received signals. This is a known technology in signal detection. It depends on analysing a number of samples before resynchronizing, and is therefore said not to be instantaneous.

#### Objects of the invention

A main object of the present invention is to suggest a solution which automatically compensates for the cable delay and makes sure that data is always clocked in the middle of the symbol.

Another object of the present invention is to present a method wherein existing equipment is utilised in a far more expedite manner.

Still another object of the present invention is to provide a method by which time delay compensation is independent of the length of the transmission cable.

#### Brief summary of the invention

The above objects are achieved by a method as stated in the preamble, which according to the present invention is characterised by the features as stated in the characterising clause of the enclosed patent claim 1.

More specifically the present invention suggests to use the transition on the transmitted data (T-circuit on X.21) as a reference for adjusting (resetting) a counter which controls the data sampling.

Further features and advantages of the present invention will appear from the following detailed description of embodiments, taken in conjunction with the enclosed drawings, as well as from the appending patent claims.

As for the feature characteristics of the invention, reference is made to the claims.

Disclosure of the drawings

Fig. 1 is a schematical diagram illustrated an example of a data transmission with related interfaces, wherein an embodiment of the present invention can be implemented.

Fig. 2 illustrates time diagrams related to transmitted data, signal element timing and received data, all in accordance with an appropriate embodiment of the present invention.

Detailed description of embodiments

With reference to Fig. 1 and Fig. 2 there will now in the following be described an example of how the method according to the present invention may be implemented.

As stated previously, the invention relates to a method which automatically compensates for the cable delay and makes sure that data is always clocked in the middle of the symbol.

The method uses the transition on the transmitted data (T-circuit on X.21) as a reference for adjusting (resetting) a counter which controls the data sampling.

The transmit data on the DCE-interface is delivered from the DTE with reference to the S-circuit (signal element timing) but with the mentioned cable delay. By clocking the data of the T-circuit into a buffer with the variable phase clock and clocking out with reference to the S-clock, error free operation is secured independent of delay.

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## ADVANTAGES

The described invention makes it possible to use the X.21 interface for high bit-rates on long cables. Installation work and operational uncertainties are eliminated and  
5 standard X.21 can be used.

## BROADENING

The principle can be used for any synchronous interface with contra-directional timing.

P a t e n t   c l a i m s  
( a m e n d e d   2 0 . 0 6 . 0 0 )

1. Method for compensating a cable delay in transmitted data signals (5) which are sent through a cable (1) connecting data communication equipment (DCE) to data transmission equipment (DTE), the DCE including a counter which controls the data sampling at the DCE with a signal element clock, a variable phase clock and a buffer, characterized in that the transmitted data signals (4) are delivered from the DTE with reference to the signal element clock signals including cable delay (3), and that the transitions (7) in the transmitted signal (5) on the DCE from the DTE, also including the cable delay, is used as a reference for resetting said counter for thereby ensuring that data always is sampled in the middle of the symbols of the transmitted signals (5) at the DCE.

2. Method as defined in claim 1, characterized in that the transmitted signals (4) in the DTE are clocked into said buffer with said variable phase clock, and are clocked out with reference to said signal element clock signals including cable delay (3).

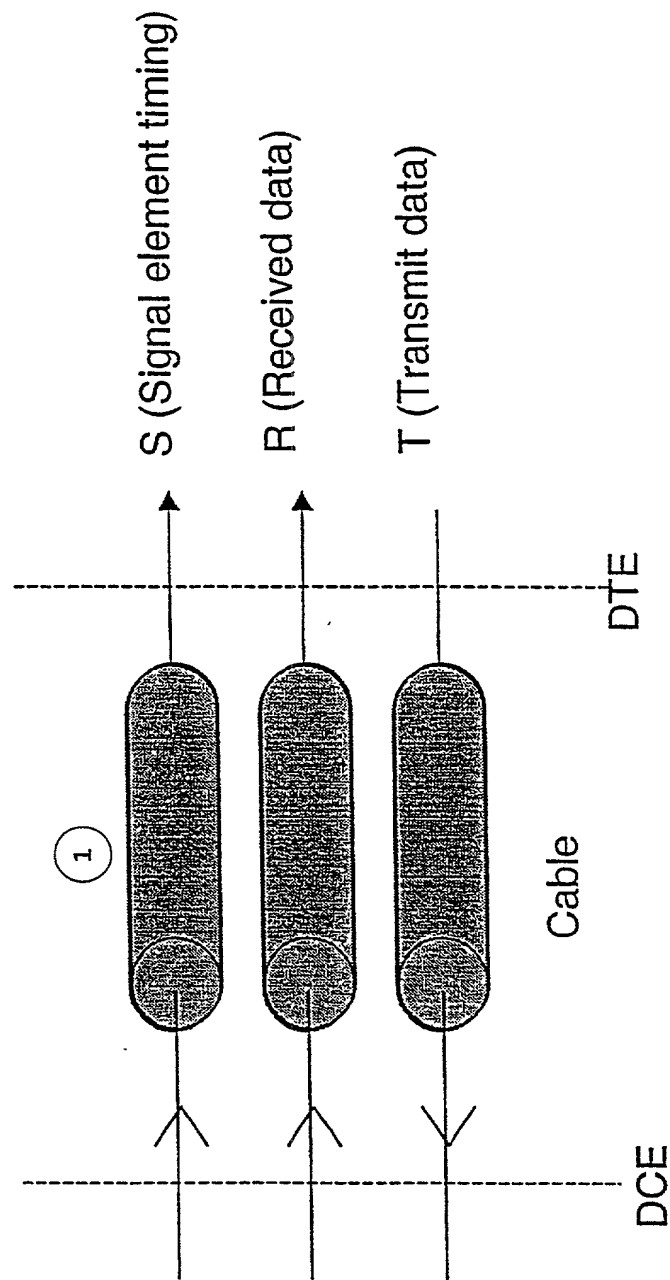


FIG.1

2/2

X.21 Interface (clock and data)

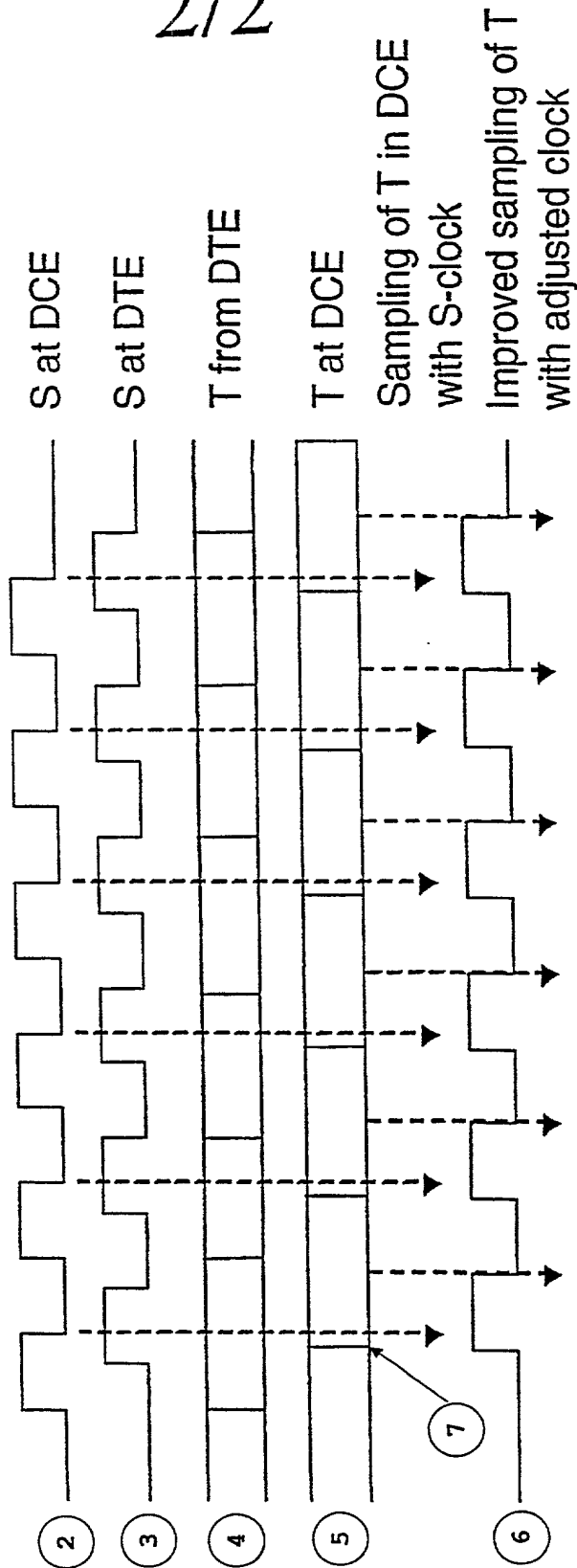


FIG. 2

PATENT APPLICATION  
DOCKET NO.: 28170-00026  
142516/EC/BF/-

**RULES 63 AND 67 (37 C.F.R. 1.63 and 1.67)  
DECLARATION AND POWER OF ATTORNEY**

**FOR UTILITY/DESIGN/CIP/PCT NATIONAL APPLICATIONS**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name; and

I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **METHOD RELATED TO CLOCK DELAY COMPENSATION**, the specification of which: (mark only one)

- (a) is attached hereto.  
X (b) was filed on Nov. 20, 2000 [I.A. Filing Date: 20 May 1999] as Application Serial No. 09/700,970 and was amended on \_\_\_\_\_ (if applicable)  
— (c) was filed as PCT International Application No. PCT/NO99/00160 on 20 May 1999 and was amended on \_\_\_\_\_ (if applicable).  
— (d) was filed on \_\_\_\_ as Application Serial No. \_\_\_\_ and was issued a Notice of Allowance on \_\_\_\_.  
— (e) was filed on \_\_\_\_ and bearing attorney docket number \_\_\_\_

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above or as allowed as indicated above.

I acknowledge the duty to disclose all information known to me to be material to the patentability of this application as defined in 37 CFR § 1.56. If this is a continuation-in-part (CIP) application, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose to the Office all information known to me to be material to patentability of the application as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

I hereby claim foreign priority benefits under 35 U.S.C. § 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for

divisionals, appeals, reissues, substitutions, and extensions thereof and to transact all business in the United States Patent and Trademark Office connected therewith, to appoint any individuals under an associate power of attorney and to file and prosecute any international patent application filed thereon before any international authorities, and I hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/organization who/which first sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct them in writing to the contrary.

Please address all correspondence and direct all telephone calls to:

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 214/855-4500  
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

# NAMED INVENTOR(S)

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	<b>Full Name</b>	<b>Inventor's Signature</b>	<b>Date</b>
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	<b>Residence</b> (city, state, country)		
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	N-3400 LIER, Norway		
	<b>Post Office Address</b> (include zip code)		

patent or inventor's certificate filed by me or my assignee disclosing the subject matter claimed in this application and having a filing date :

(1) before that of the application on which my priority is claimed or, (2) if no priority is claimed, before the filing date of this application:

#### PRIOR FOREIGN PATENTS

Number	Country	Month/Day/Year Filed	Date first laid-	Date	Priority Claimed	
			open or Published	patented or Granted	Yes	No
19982361	Norway	25 May 1998				X

I hereby claim the benefit under 35 U.S.C. § 120/365 of any United States application(s) listed below and PCT international applications listed above or below:

#### PRIOR U.S. OR PCT APPLICATIONS

<u>Application No. (series code/serial no.)</u>	<u>Month/Day/Year Filed</u>	<u>Status(pending, abandoned, patented)</u>
PCT/NO99/00160	20 May 1999	Pending

I hereby appoint:

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 GERALD T. WELCH, Reg. No. 30,332  
 HAROLD N. WELLS, Reg. No. 26,044  
 WILLIAM D. WIESE, Reg. No. 45,217

all of the firm of **JENKENS & GILCHRIST, a Professional Corporation**, 1445 Ross Avenue, Suite 3200, Dallas, Texas 75202-2799, as my attorneys and/or agents, with full power of substitution and revocation, to prosecute this application, provisionals thereof, continuations, continuations-in-part,